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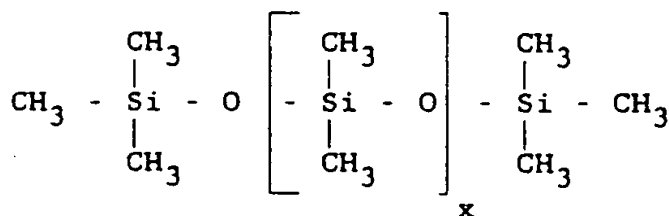
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54 Water dispersible silicone composition.

57 A composition consisting of a mixture of a silicone polymer having the formula



having a viscosity of 350-30,000 mm²/s (centistokes) and a siloxane copolymer having a viscosity of 1,500 mm²/s (centistokes) at 25°C.

This invention relates to a composition which is a mixture of a silicone polymer and a silicone copolymer that is useful as a cosmetic raw material because of its water dispersibility.

The use of silicones as cosmetic raw materials is well documented as are their benefits. One hindrance to the use of silicones in personal care products for application to the skin and hair is their limited solubility in water and other polar media frequently encountered in the cosmetic market. One solution has been to incorporate silicones by means of sometimes complex emulsion techniques which often require expensive equipment and high shear. Thus, a need exists for water dispersible silicones and silicones which have increased solubility and compatibility in water and other polar media.

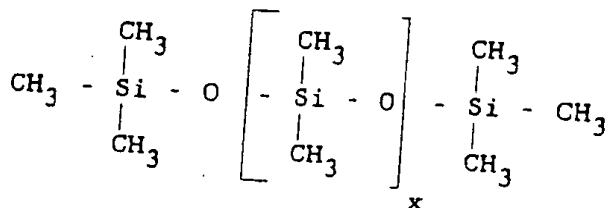
In U.S. Patent No. 4,846,982 issued July 11, 1989, there is disclosed a three-component system, including a silicone polymer, a silicone copolymer and a quaternary ammonium compound, which is useful as a conditioner in fabric care applications.

In accordance with the present invention, it has been unexpectedly found that when only the silicone polymer and the silicone copolymer are combined, these two components form homogeneous mixtures which can be further diluted with water to form shelf stable products without emulsification. This finding alone increases the value of the silicones as cosmetic raw materials.

It is an object of the present invention to provide silicone materials which can be incorporated into an aqueous system without using sophisticated high shear equipment. It is also an object to provide silicone materials which are water dispersible and which, when combined with water, form a water solution which is shelf stable.

The silicone polymer according to the present invention is a polydimethylsiloxane and can be a high molecular weight silicone polymer having a number average molecular weight in the range of 200 to 200,000. Suitable silicone polymers include those materials having a viscosity in the range of 20 to 2,000,000 mm²/s (centistokes), preferably 100 to 50,000 mm²/s (centistokes), more preferably 350 to 30,000 mm²/s (centistokes), measured at 25°C. Typically, the silicone polymer is endblocked with either trimethylsilyl or hydroxy groups but other endblocking groups are also appropriate. These silicone polymers are well known in the art and can be prepared by various techniques such as the hydrolysis of dimethyldihalosilanes and subsequent condensation of the resulting hydrolysis product or by the cracking and subsequent polymerization of dimethylcyclosiloxanes.

These silicone polymers can be represented by the formula:



in which x is an integer having a value of from one to one hundred thousand. Preferably, x has a value of about six hundred and the nominal viscosity of the silicone polymer is about five thousand mm²/s (centistokes) measured at 25°C.

The silicone copolymers of the present invention and methods for their preparation are described in U.S. Patent No. 3,402,192, issued September 17, 1968. Such materials are copolymers having the average structural formulae:

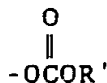
- (1) $\text{R}_a\text{Si}[(\text{OSiMe}_2)_n(\text{OSiMeG})_c\text{OSiMe}_2\text{G}]_{4-a}$,
- (2) $\text{GMe}_2\text{Si}[(\text{OSiMe}_2)_n(\text{OSiMeG})_c\text{OSiMe}_2\text{G}]_{4-a}$,
- (3) $\text{Me}_3\text{Si}[(\text{OSiMe}_2)_n(\text{OSiMeG})_c\text{OSiMe}_3]_{4-a}$, and
- (4) $\text{R}_a\text{Si}[(\text{OSiMe}_2)_n(\text{OSiMeG})_c\text{OSiMe}_3]_{4-a}$,

in which formulae R_a is a hydrocarbon radical free of aliphatic unsaturation and has from 1 to 10 carbon atoms, Me is a methyl radical,

G is a radical of the structure $-\text{D}(\text{OR}'')_m\text{A}$ wherein D is an alkylene radical containing from 1 to 30 carbon atoms,

R'' is composed of ethylene radicals and radicals selected from propylene and butylene radicals, the amount of ethylene radicals relative to the other alkylene radicals being such that the ratio of carbon atoms to oxygen atoms in the total OR'' blocks ranges from 2.3:1 to 2.8:1,

$\frac{m}{A}$ has an average value from 7 to 100, A is a radical selected from $-\text{OR}'$, $-\text{OOCR}'$ and



radicals wherein R' is a radical free of aliphatic unsaturation selected from hydrocarbon and hydrocarboxy radicals, the A radical containing a total of less than eleven atoms,

- a has an average value of from 0 to 1,
- n has an average value of from 6 to 420,
- d has an average value of from 0 to 30,
- b has an average value from 1 to 30 and
- c has an average value from 3 to 30,

said copolymers containing at least 13 percent by weight OSiMe₂ units based on the weight of the copolymer.

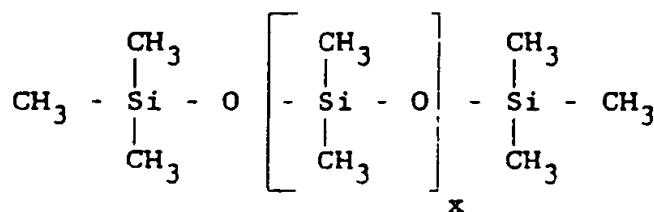
The water dispersible silicone of the present invention constitutes 25 to 75 percent by weight of the silicone polymer and 75 to 25 percent by weight of the silicone copolymer described above. Some particularly preferred embodiments of the water dispersible silicone contain 25 percent by weight of the silicone polymer and 75 percent by weight of the silicone copolymer, 50 percent by weight of the silicone polymer and 50 percent by weight of the silicone copolymer and 75 percent by weight of the silicone polymer and 25 percent by weight of the silicone copolymer.

These compositions are prepared by simply mixing together the two ingredients in the appropriate proportions until a homogeneous mixture is obtained. It has been found that the two ingredients form a homogeneous white creamy mixture and that the mixture is stable and highly water dispersible. Water solutions of the mixture are creamy white and exhibit a blue haze. The water solutions of the mixture are also shelf stable. The mixture is formed into water solutions containing up to sixty-five percent by weight of water. The mixture may be added to various aqueous systems such as emulsions, microemulsions, solutions, dispersions and suspensions.

The following examples are set forth for the purpose of illustrating the present invention in more detail.

EXAMPLE

Several blends of a silicone polymer and a silicone copolymer were prepared by adding specific proportions of each ingredient into a container and mixing the ingredients until uniform and homogeneous. The various blends which were prepared are shown below in the table which indicates the weight percent of each of the silicone polymer and the silicone copolymer and the viscosity of the silicone polymer in each instance. The silicone polymer used in the example had the formula:



in which x was selected in each instance to provide silicone polymers having viscosities of 350; 5,000; 12,500; and 30,000 mm²/s (centistokes) respectively. The silicone copolymer used in the example for the preparation of each blend had the structural formula (3) noted above and a nominal viscosity of fifteen hundred mm²/s (centistokes).

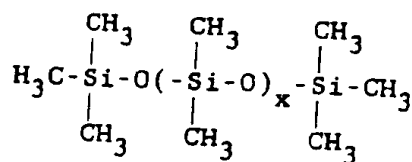
TABLE

Blend	Silicone Polymer Weight Percent	Silicone Copolymer Weight Percent	Silicone Polymer Viscosity mm ² /s(cs)
I	50	50	350
II	25	75	5,000
III	50	50	5,000
IV	75	25	5,000
V	25	75	12,500
VI	50	50	12,500
VII	75	25	12,500
VI II	50	50	30,000

All of the Blends I-VIII formed stable homogeneous mixtures. For example, Blend I formed a milky gelatinous mixture. Blends II and III formed thick milky solutions. Blend IV was a thick solution resembling a thick phase emulsion. Blends V-VII were creamy white fluids and Blend VIII was a smooth clear thick mixture. Water solutions containing varying amounts of Blends I-VIII and up to sixty-five percent by weight of water were prepared and found to be shelf stable bluish white emulsion-like solutions.

Claims

1. A water dispersible silicone composition consisting of a mixture of 25 to 75 percent by weight of a polydimethylsiloxane polymer having the formula:



where x is an integer having a value of from one to about one hundred thousand and 75 to 25 percent by weight of a siloxane copolymer having a formula selected from:

- (1) $\text{RSi}[(\text{OSiMe}_2)_n(\text{OSiMe}_2\text{G})_4]$,
- (2) $\text{GMe}_2\text{Si}[(\text{OSiMe}_2)_n(\text{OSiMeG})_6\text{OSiMe}_2\text{G}]$,
- (3) $\text{Me}_3\text{Si}[(\text{OSiMe}_2)_n(\text{OSiMeG})_6\text{OSiMe}_3]$,
- (4) $\text{RSi}[(\text{OSiMe}_2)_n(\text{OSiMeG})_6\text{OSiMe}_3]_4$,
- (5) $\text{RSi}[(\text{OSiMe}_2)_n(\text{OSiMeG})_6\text{OSiMe}_2\text{G}]_3$,
- (6) $\text{RSi}[(\text{OSiMe}_2)_n(\text{OSiMeG})_6\text{OSiMe}_3]_3$,

in which formulae R is a hydrocarbon radical free of aliphatic unsaturation and has from 1 to 10 carbon atoms,

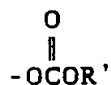
Me is a methyl radical,

G is a radical of the structure $-\text{D}(\text{OR}'')_m\text{A}$ wherein D is an alkylene radical containing from 1 to 30 carbon atoms,

R'' is composed of ethylene radicals and radicals selected from propylene and butylene radicals, the amount of ethylene radicals relative to the other alkylene radicals being such that the ratio of carbon atoms to oxygen atoms in the total OR'' blocks ranges from 2.3:1 to 2.8:1,

$\frac{m}{A}$ has an average value from 7 to 100,

A is a radical selected from $-\text{OR}'$, $-\text{OOCR}'$ and



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radicals, wherein R' is a radical free of aliphatic unsaturation selected from hydrocarbon and hydrocarboxy radicals, the A radical containing a total of less than eleven atoms,

$\frac{n}{d}$ has an average value of from 6 to 420,

has an average value of from 1 to 30,

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$\frac{b}{c}$ has an average value from 1 to 30 and

has an average value from 3 to 30,

said copolymers containing at least 13 percent by weight OSiMe₂ units based on the weight of the copolymer.

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2. A composition according to claim 1 in which the silicone polymer has a viscosity in the range of 20 to 2,000,000 mm²/s (centistokes) at 25°C.

3. A method of incorporating silicone into an aqueous medium comprising adding to the aqueous medium a water dispersible silicone composition of claim 1.

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4. A method according to claim 3 in which the aqueous medium is an emulsion containing up to sixty-five percent by weight of water.

5. A cosmetic containing the water dispersible silicone composition of claim 1.

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6. A cosmetic manufactured by incorporating silicone into an aqueous medium comprising adding to the aqueous medium a water dispersible silicone composition of claim 1.

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